Differences in immune responses create a genetic conflict between sexes

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A unique study from Lund University in Sweden has discovered for the first time that there is a genetic sexual conflict in the immune system in animals. In females, the variation in central genes of the immune system is too high, whereas in males, it is too low. The researchers argue that the conflict is linked to differences in the immune responses of females and males.

The fact that the strength of immune responses varies between males and females is well known. For example, in humans, this is indicated by men catching infections more frequently than women. The reason behind this is the immune-regulating effects of sex hormones, which cause a generally lower expression of the immune system in males. In other words, the male immune system is usually not as effective as that of females.

The new study, conducted by biologists from the Faculty of Science at Lund University in Sweden, looked at a wild population of great reed warblers using data gathered over more than 20 years. The researchers sequenced immune system genes of the Major Histocompatibility Complex (MHC) and compared how the variation of these genes affected males, females and their offspring.

The results show that males with a high variation of MHC genes gained better territories and had a higher survival rate among their offspring. The opposite applied to females, as their offspring had a decreased survival rate. Thus, in females it was an advantage to have a lower variation of MHC genes.

"Unfortunately, this conflict cannot be solved. Females prefer males with good territories, but in the bargain they get males with high variation in their MHC genes. The offspring thereby inherit this variation from their father, which is good for the sons but a disadvantage for the daughters," says doctoral student Jacob Roved.

"The conflict is maintained by the fact that the parents' MHC genes are mixed equally between the sexes in the offspring. Therefore, the genetic predispositions of both high and low MHC variation are retained in the population, and it becomes a Catch 22 where each sex will either benefit or lose from having a certain predisposition," Jacob Roved explains.

This type of genetic sexual conflict in the immune system has never previously been observed in animals. One reason for its discovery is the recent technological development within DNA sequencing. The researchers argue that this phenomenon may also occur in many other species.

"Most vertebrates, including humans, have the same immune system structure and similar differences between the sexes in their immune response. We believe that the conflict is associated with these differences in the immune system, and future studies should therefore investigate how widespread such conflicts are," argues Jacob Roved.

More information: Jacob Roved et al. Evidence for sexual conflict over major histocompatibility complex diversity in a wild songbird, *Proceedings of the Royal Society B: Biological Sciences* (2018). DOI: 10.1098/rspb.2018.0841

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